

## Toxicology trainee honored for translational research

By Eddy Ball

For most graduate students, the Ph.D. is the highest point of the academic experience, but for NTP trainee **Madisa Macon, Ph.D.**, the degree comes with an added distinction. Even before she officially received her diploma, Macon took home a prestigious award for research that generates knowledge and innovative solutions to address critical societal needs - in her case, the public health impact of human exposure to endocrine-disrupting chemicals.

Along with the degree in toxicology she'll receive May 10 during graduation ceremonies at the University of North Carolina at Chapel Hill (UNC), Macon is one of 20 graduate students presented a 2014 Impact Award from the UNC Graduate Education Advancement Board during the 16th Annual Graduate Student Recognition Celebration April 24 in Chapel Hill, N.C.

Macon is a trainee in the Reproductive Endocrinology Group of the NTP Laboratory, headed by her Intramural Research Training Award mentor and dissertation advisor, **Suzanne Fenton, Ph.D.** Macon studies the mechanistic basis of health effects following prenatal exposure to perfluorooctanoic acid (PFOA) in mice (see [text box](#)).

As the award committee wrote in its announcement of the winners, "Published data from Macon's studies have already been used by two agencies in their human health assessment of PFOA toxicity. Her research has the potential to further inform regulatory agencies in North Carolina and beyond in their risk assessment of PFOA."



*Macon's study of PFOA was selected as a 2011 NTP paper of the year. (Photo courtesy of Steve McCaw)*

### Moving insights at the bench into public health

In keeping with the NIEHS and NTP public health mission, Fenton's group is deeply concerned with the potential public health impact of its studies of human disease, using mice and rat models, translating internal dose in animal models to known exposure levels in U.S. residents.

"Madisa has worked very hard for the sake of public health. She has performed her studies to help us understand the potential effects of children's exposure to this harmful chemical," Fenton explained. "Importantly, she has discovered modes of action for effects of PFOA in the breast, which seems to be a particularly sensitive target tissue. She is very deserving of this award."

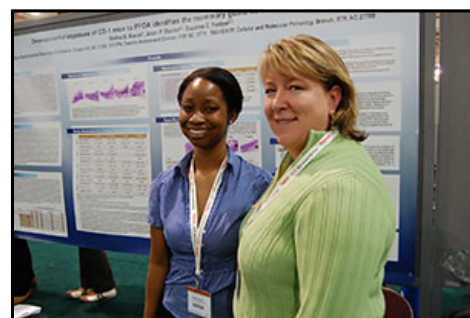
### Advancing a career with support from NIEHS and NTP

After completing her undergraduate work at Xavier University of Louisiana and a Master of Public Health degree at Drexel University, Macon joined Fenton's group, at NIEHS, in 2009 as a predoctoral fellow, as she pursued her Ph.D. from the UNC School of Medicine [Curriculum in Toxicology](http://www.med.unc.edu/toxicology/research).  
(<http://www.med.unc.edu/toxicology/research>)

. Fenton is one of eight NIEHS lead researchers who serve as members of the curriculum, and currently serves on its executive committee.

In addition to her doctoral degree and award, Macon was first author on two peer-reviewed publications by Fenton's group. She has been active in the Society of Toxicology (SOT) nationally, and at the state level as a North Carolina Chapter representative. Her future plans include continuing as a postdoctoral fellow in the Tumor Biology Program at Georgetown University, as she works toward toxicology certifications, including the Diplomate of the American Board of Toxicology, and sharpens her career focus in the field of cancer.

"I am very grateful for the opportunities I've enjoyed at NIEHS and in the NTP Laboratory," Macon said, "and I can't say enough about how much Sue has helped me as mentor and advisor. I'm especially proud that UNC has recognized the public health impact of my work on PFOA, and I am grateful for Sue's guidance during my research."



*Fenton, right, joined Macon during a poster presentation at the Society of Toxicology annual meeting in March 2010. (Photo courtesy of Ed Kang)*

## Citations:

Macon MB, Fenton SE.

(<http://www.ncbi.nlm.nih.gov/pubmed/23417729>)

2013. Endocrine disruptors and the breast: early life effects and later life disease. *J Mammary Gland Biol Neoplasia* 18(1):43-61.

Macon MB, Villanueva LR, Tatum-Gibbs K, Zehr RD, Strynar MJ, Stanko JP, White SS, Helfant L, Fenton SE.

(<http://www.ncbi.nlm.nih.gov/pubmed/21482639>)

2011. Prenatal perfluorooctanoic acid exposure in CD-1 mice: low-dose developmental effects and internal dosimetry. *Toxicol Sci* 122(1):134-145.

### PFOA and human health

Fenton's group is interested in the developmental effects of high-use or high-exposure environmental compounds, such as PFOA, also known as C8.

PFOA was a natural choice for research by the group. It is a long-chained perfluorinated chemical that does not occur naturally in the environment, and has special properties and hundreds of manufacturing and industrial applications, most notably in coatings for nonstick cookware. It meets the requirements as a chemical of interest for environmental scientists, because of its persistence in the environment and in the blood of the general U.S. population, as well as its demonstrated developmental and other adverse effects in laboratory animals.

Although regulatory action on PFOA currently resides at the state level, the [U.S. Environmental Protection Agency \(EPA\)](http://www.epa.gov/oppt/pfoa/pubs/pfoainfo.html) (<http://www.epa.gov/oppt/pfoa/pubs/pfoainfo.html>)

is working with major companies to reduce emissions and product content of PFOAs, with the goal of eliminating production and use of the chemical by 2015. In 2009, EPA issued Provisional Health Advisories that included PFOA, to protect against potential risk from exposure to the chemical through drinking water.

EPA nominated PFOA for [NTP study](http://ntp.niehs.nih.gov/?objectid=BD40E838-123F-7908-7B489F914405394E)

(<http://ntp.niehs.nih.gov/?objectid=BD40E838-123F-7908-7B489F914405394E>)

in 2003. Since then, NTP scientists and contractors have performed short-term toxicity, long-term carcinogenicity, and a range of special studies on the compound. In a Sept. 20, 2013 announcement in the [Federal Register](http://ntp.niehs.nih.gov/ntp/pressctr/frn/2013/78frn183roc20130920_hm.pdf),

([http://ntp.niehs.nih.gov/ntp/pressctr/frn/2013/78frn183roc20130920\\_hm.pdf](http://ntp.niehs.nih.gov/ntp/pressctr/frn/2013/78frn183roc20130920_hm.pdf))

NTP listed PFOA among twenty new substances nominated for possible review for future editions of the [Report on Carcinogens](http://ntp.niehs.nih.gov/go/rocnom).

(<http://ntp.niehs.nih.gov/go/rocnom>)

The [C8 Science Panel](http://www.c8sciencepanel.org/),

(<http://www.c8sciencepanel.org/>)

organized to research the potential health effects of PFOA in industry-contaminated parts of West Virginia and Ohio, has determined that PFOA may have a probable link to kidney cancer, testicular cancer, ulcerative colitis, thyroid disease, hypercholesterolemia, and pregnancy-induced hypertension, including preeclampsia, in humans.

Research by Macon and her colleagues in Fenton's group is making significant contributions toward understanding how exposure to PFOA, and other chemicals of interest, may also impact early life human development and lifelong health more subtly through modifications in gene expression triggered by low-dose exposures during critical windows of development.

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